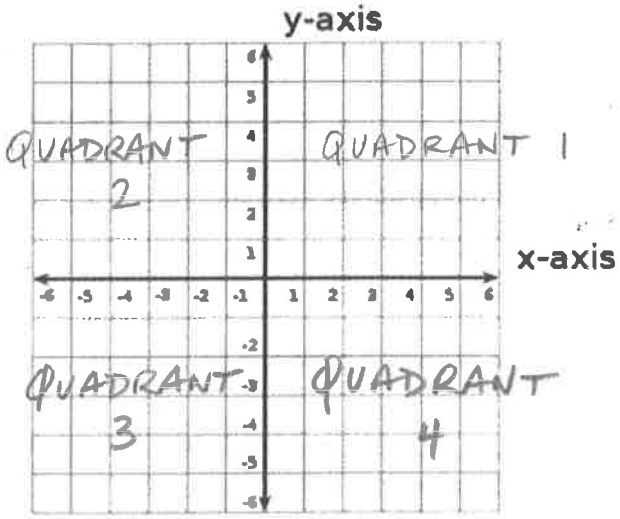
2.1 Bar Graphs

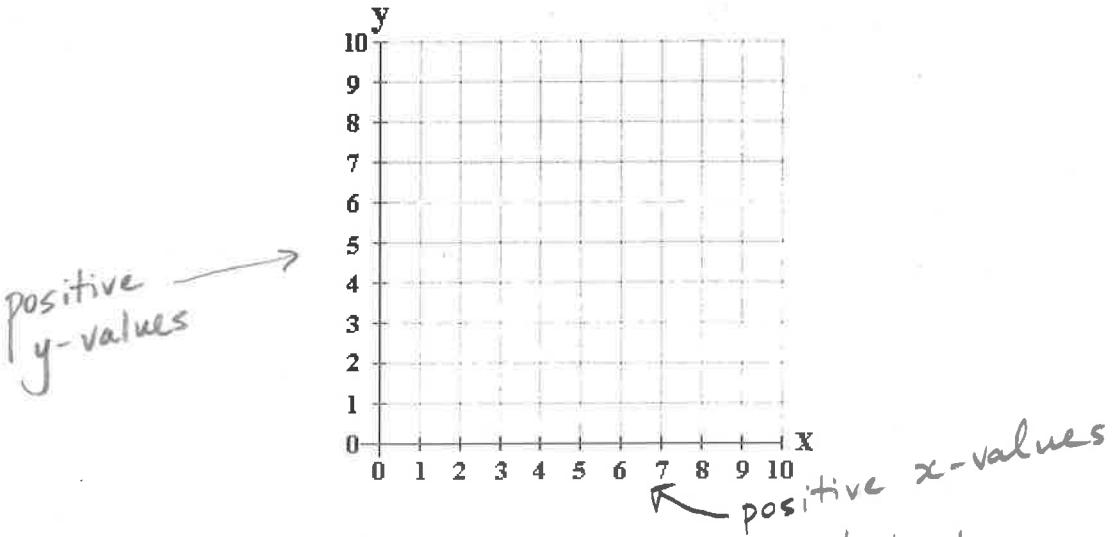
Reading Graphs

A graph is a two-dimensional (horizontal/vertical) representation of data. It relies upon two AXES:

- the HORIZONTAL axis, otherwise known as the x-axis; and
- the VERTICAL axis, otherwise known as the y-axis.



Because most 'real-life' situations do not involve negative numbers (eg: time, mass, density, etc.), we tend to see data represented in a graph of Quadrant 1 only:



In the case of graphs such as these, it is important to label both the *x* and *y*-axes with a title and a unit of measurement, where applicable.

BAR GRAPHS, SPECIFICALLY

Legends:

- A *bar* graph may compare more than one data set on the same *x* and *y* axis.
- If this occurs, a legend/key will allow the reader of the graph to interpret the differences between the data sets by utilizing different colours, shading, symbols, etc.

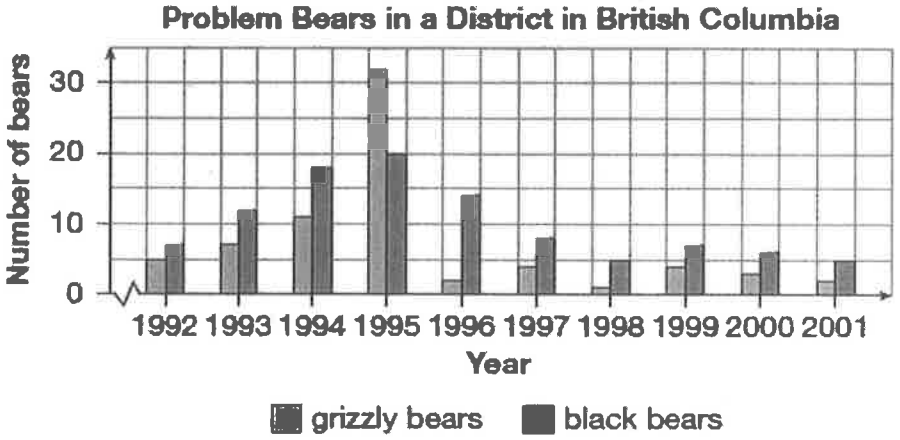
Trends:

- A trend is a recognizable relationship between two variables.
- Trends are usually described using words such as increasing, decreasing, unchanging, etc.

Ranges:

- A range is used to measure a trend or compare two variables.
- The *range* is the difference between the minimum (lowest) y-value and the maximum (highest) *y*-value in a set of data.

Example:



1. What is being measured on the *x*-axis? What unit is being used?
   time — years
2. What is being measured on the *y*-axis? What unit is being used?
   number of bears — number
3. What are the two groups of data indicated on this graph? What sort of legend is being used to distinguish between these two different data sets?
   grizzly bears (lighter) vs. black bears (darker)
4. Describe the trend that you see with respect to Problem Black Bears.
   1992 - 1995 increasing ; 1995 - 2001 decreasing
5. What is the range that is observed for Problem Grizzly Bears?

   32 − 1 = 31
   highest lowest

Drawing Graphs

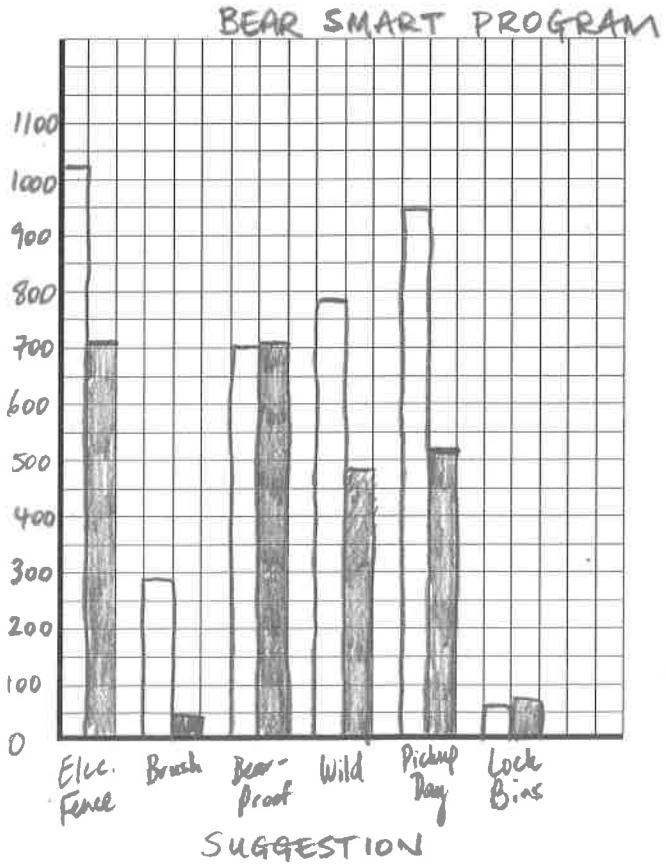
Example:

Two towns (Town 1 and Town 2) are trying to decide how to best protect bear populations while keeping their community safe. Using the data provided in the table below, create a graph that will help the towns make a decision.

Bear Smart Program		
Suggestion	Votes: Town 1	Votes: Town 2
use safe electric fence around landfill	1020	711
remove brush in town	294	47
use bear-proof garbage cans	701	710
move problem bears to the wild	773	479
put out garbage on pickup day only	948	518
lock commercial garbage bins	60	76

Steps to think about:

1. Determine the maximum value of the range (ie. What is the highest number of votes you see on the table?): 1020. Set the minimum value of the range to 0. Use this to help you determine the scale for the vertical (y) axis of your graph. Record this scale on the graph and label the y-axis. 25 squares
   Let each square = 50
2. Record (label) the Suggestions on the horizontal axis of your graph (the order does not matter, but you may as well follow the order given in the table).
3. Create a legend to differentiate between Town 1 and Town 2.
4. Give your Bar Graph a title.



Legend ☐ Town 1
▨ Town 2

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2.2 Histograms

Histogram:

- a graph that organizes data into INTERVALS of equal size.
- each bar represents the FREQUENCY of each interval.
- a histogram looks a LOT like a bar graph, but the data is continuous, rather than primarily discrete.

Intervals:

- An interval is a specific section of DATA.
- Usually separated by on the x-axis by a numerical value.
- Includes numbers that are greater than (but not including) the LESSER value and up to (and including) the GREATER value.
- Example: the interval 100-350 would include the number 101 through to 350 (but not the number 100).

Frequency Table:

- a table that indicates the number of items in each INTERVAL.

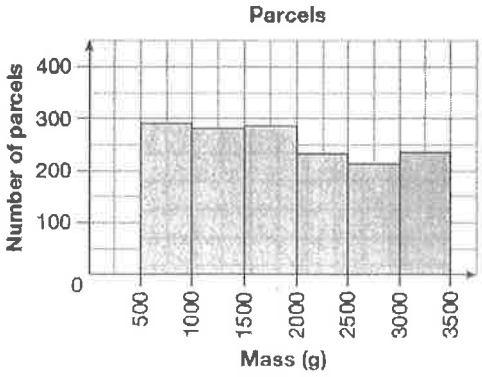
Example 1:

The following frequency table and histogram represent compiled data from the Langford Post Office during the Christmas season of 2016:

FREQUENCY TABLE

Mass (g) (over–including)	Number of parcels
500–1000	292
1000–1500	282
1500–2000	287
2000–2500	233
2500–3000	214
3000–3500	236

HISTOGRAM



1. What does the width of each interval (bar) represent with respect to grams? 500g
2. Are you able to find the exact mass of any parcel from this histogram? No.
3. What is the least possible mass as represented by this frequency table and histogram? What is the greatest possible mass? 501g. 3500g.

4. In general, what does the histogram seem to show?

There is a fairly even frequency of parcels in each interval.

Example 2:

The following table shows information from 32 different potato farms. Each number represents the number of acres farmers at each farm are utilizing to grow potatoes.

139	61	358	169
126	350	62	159
502	290	150	74
61	462	59	122
187	72	76	66
123	66	150	191
130	145	150	231
398	836	208	420

1. Organize the data into <u>intervals</u>.

2. To determine the amount of intervals to use, find the range as indicated by the data in the table (ie. Find the lowest number and the highest number and determine the *difference*). Lowest: 59 Highest: 836

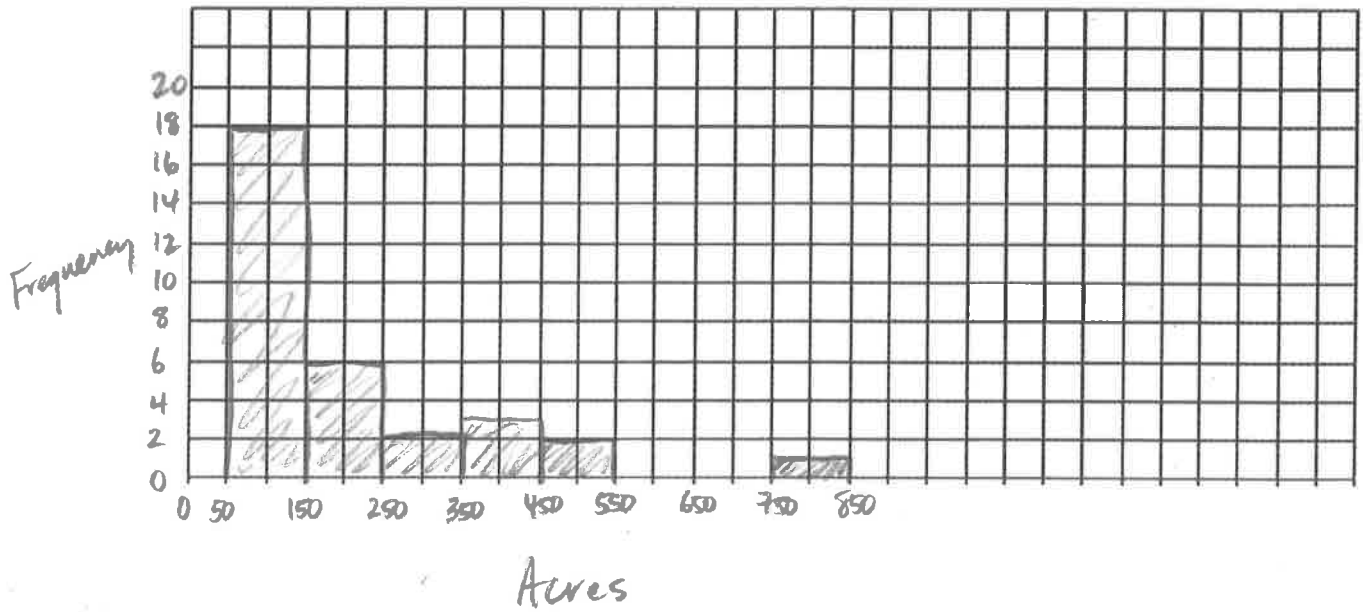
$836 - 59 = 777$

3. We will use a width of <u>100</u> for each interval. Divide your range by this number and round <u>up</u> to determine how many intervals to create. $777 \div 100 = 7.77 \Rightarrow$ <u>8</u> intervals

4. Create a frequency table.

Acres (interval)	50-150	150-250	250-350	350-450	450-550	550-650	650-750	750-850
Frequency	18	6	2	3	2	0	0	1

5. Create a histogram using your frequency table (be sure to label the axes appropriately).



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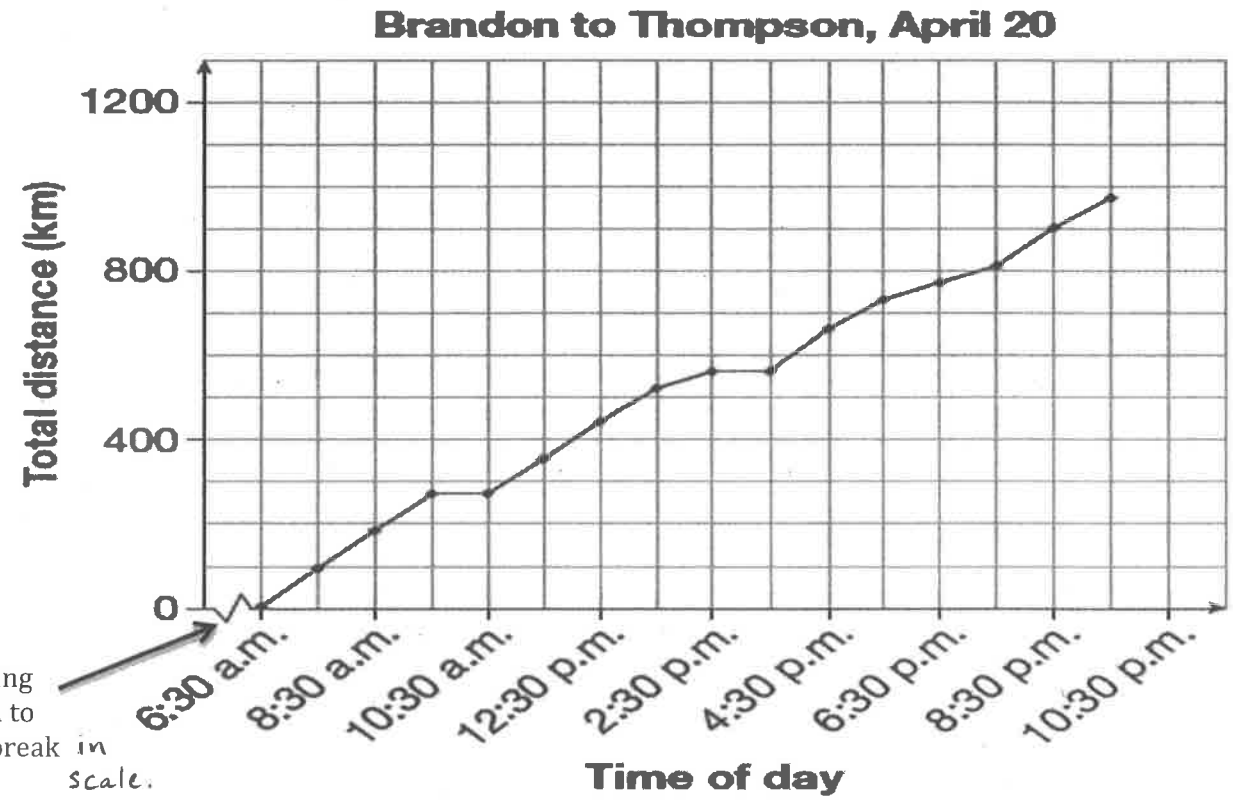
2.3 Line Graphs

Reading Line Graphs: Using the following line graph that shows driving distance over a day, answer the questions below:



The 'lightning bolt' – used to indicate a break in scale.

1. In general, what happens to the total distance driven as time increases?

   It increases.

2. What must be occurring between 9:30-10:30 am? When does this happen again?

   Stopping somewhere. $2^{30} - 3^{30}$.

3. In total, how far has the car driven by 12:30 pm?

   450 km

4. How long did the entire trip take?

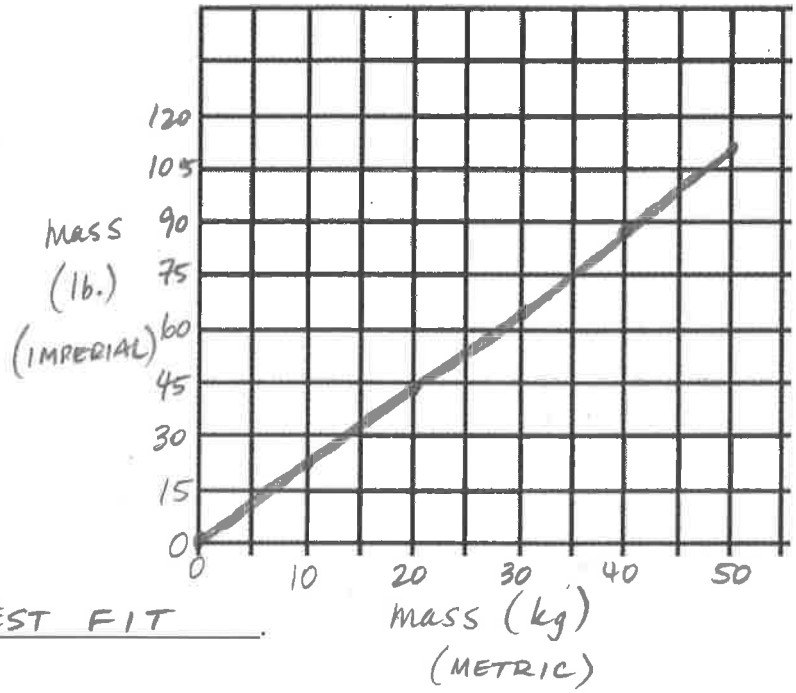
   6^{30} am $- 9^{30}$ pm $=$ 15 hours.

Example 2:

Using the data table provided below, create a graph to show the mass in kilograms and pounds (Hint: place kg on the x-axis and lbs. on the y-axis):

Metric and Imperial Mass
10 kg ≈ 22.05 lb
20 kg ≈ 44.09 lb
30 kg ≈ 66.14 lb
40 kg ≈ 88.18 lb
50 kg ≈ 110.23 lb

Kilograms compared to Pounds



Connect the points using a line of BEST FIT.

Trends:

- As the mass in kilograms increases, the mass in pounds INCREASES.
- The points lie in a STRAIGHT LINE while moving UP to the right.

1. Use the graph to convert 7 kg to pounds.

   approx. 17 lbs.

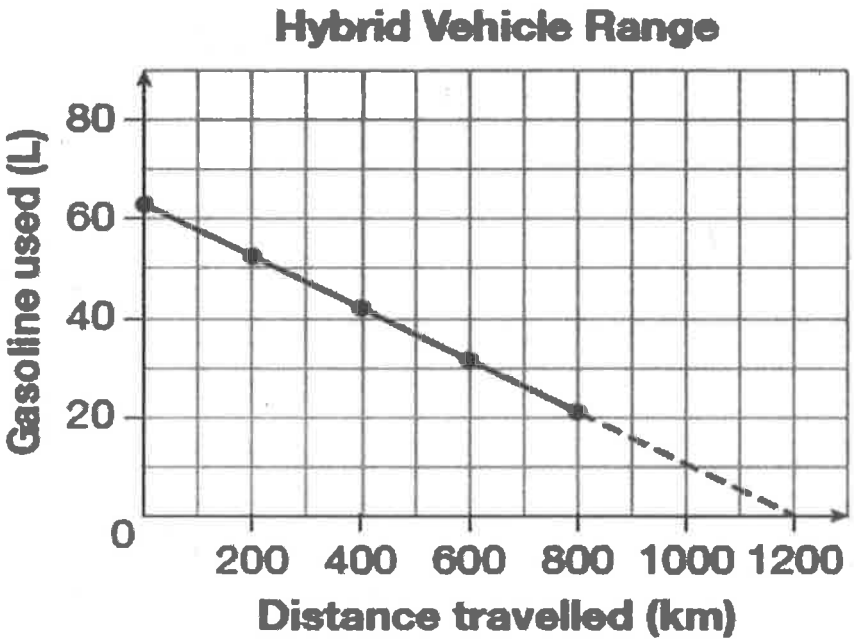
2. Use the graph to convert a 54 lb. to kilograms.

   approx. 25 kg.

To estimate a value BETWEEN known points on a graph is known as INTERPOLATION. Shown above by the line of best fit!

Example 3:

Shawna created the following graph about the fuel economy of her new hybrid car:



1. Approximately how much gas does the car hold?

   approx 62-63 L

2. What trend does the graph show?

   As the car drives, gas is used.

3. If Shawna does not buy any more gas, approximately how far can she go on a full tank?

   1200 km

To estimate a value OUTSIDE known points on a graph is called **EXTRAPOLATION**.
Shown above by the dotted line!

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2.5 Circle Graphs

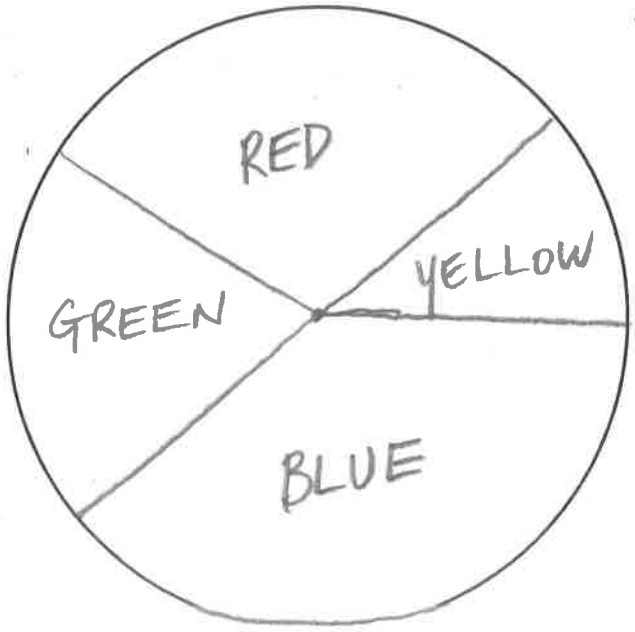
Circle Graphs

- Used to represent portions of a single type of data.
- To create the portions, we must find the PERCENTAGE each portion represents of the total data.
- The percentage is then converted to degrees and drawn within a CIRCLE (you will need a PROTRACTOR to do this).
- The number of degrees in a circle = 360°.
- So, to find the degrees represented by each portion, use the following calculation:

$$\% \text{ (as a decimal)} \times 360^\circ$$

Example 1: 60 students were asked to pick their favourite colour out of the choices listed in the table below. The table indicates the results. Create a circle graph that is representative of this information.

Colour	Number of Students	Percent	Part of Circle
Red	18	$\frac{18}{60} = 0.3 = 30\%$	$0.3 \times 360^\circ = 108^\circ$
Yellow	7	$\frac{7}{60} = 0.117 = 11.7\%$	$0.117 \times 360^\circ = 42^\circ$
Blue	23	$\frac{23}{60} = 0.383 = 38.3\%$	$0.383 \times 360^\circ = 138^\circ$
Green	12	$\frac{12}{60} = 0.2 = 20\%$	$0.2 \times 360^\circ = 72^\circ$
Total:	60		



Example 2:

Nellie works at a bakery. In every 8-hour shift she spends the following amounts of time doing different activities:

- Baking: 4.5 hours
- Two 15-minute breaks
- Cleaning: 2.25 hours
- Lunch: 0.75 hour

Create a circle graph of this data.

Activity	Hours	Percent	Angle Measure
Baking	4.5	$\frac{4.5}{8} = 0.5625 = 56.25\%$	$0.5625 \times 360^\circ = 203^\circ$
Cleaning	2.25	$\frac{2.25}{8} = 0.28125 = 28.125\%$	$0.28125 \times 360^\circ = 101^\circ$
Breaks	0.5	$\frac{0.5}{8} = 0.0625 = 6.25\%$	$0.0625 \times 360^\circ = 23^\circ$
Lunch	0.75	$\frac{0.75}{8} = 0.09375 = 9.375\%$	$0.09375 \times 360^\circ = 34^\circ$
Total	8	100%	361° (due to rounding)

Questions

1. A. Using the chart, what percent of the time does Nellie spend not baking?

   $100\% - 56.25\% = \boxed{43.75\%}$

   B. How much time does she spend not baking during a 40-hour work week?

   $0.4375 \times 40 = \boxed{17.5 \text{ hrs.}}$

2. How much time does she spend on breaks in a 40-hour work week?

   $0.5 \text{ h/day} \times 5 \text{ days} = \boxed{2.5 \text{ h.}}$

3. If Nellie makes $10.50/hour, how much would she make in 4 weeks if she does not get paid for her breaks?

   $40 \text{ hrs} - 2.5 \text{ hrs} = 37.5 \text{ hrs.}$

   $37.5 \text{ hrs/wk.} \times 4 \text{ weeks} = 150 \text{ hrs.}$

   $150 \text{ hrs.} \times \$10.50/\text{hr}$

   $\boxed{\$1575.00}$

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p. 60 #1-3